3

JAMES LIND, M.D.
EIGHTEENTH CENTURY NAVAL MEDICAL HYGIENIST

Biographical Notes with an Appreciation of the Naval Background

BY

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Part I

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In October, 1739, Britain and Spain went to war, and a fleet under Admiral Haddock was ordered to the Mediterranean. A month later Vice-Admiral Vernon, with twelve ships under his command, was sent to take Porto Bello: this was completed on 22nd November, 1739.

As in all wars, men of all callings were mustered to man the ships and fill the ranks of the soldiery. Amongst the many adventurers and patriots who left their Scottish homes to join the enlarging fleets in the South was a young man, 23 years of age, who was an apprentice to an Edinburgh surgeon. This young man was James Lind, who, with the benefit of his previous training, joined the Royal Navy as a Surgeon's Mate and began an association with this Service which was to last a lifetime. Lind was fated to light a path which dispersed the shadows of ignorance and prejudice, and he inaugurated a process of thought and action which culminated in the saving of the lives of many seamen and civilians, as well as to make the technique of living less penalizing.

The purpose of this dissertation is to give a biographical picture of the man James Lind as far as it is known ; a note of his writings and work, and then a presentation of his reforming concepts with an emphasis on his influence over his two disciples, Blane and Trotter. The remainder of the paper is an outlined appreciation of the naval health and hygienic problems from the sixteenth century to the eighteenth century, and of conditions leading to the increasing need for reform in this Service. Finally, I would like to present the naval medical practice and the outstanding adventures and events of that period of my subject, which so emphatically influenced the course of the destiny of Britain.

The family name of Lind is traced by the genealogist, Sir Robert Douglas [1], who states that James Lind of Ayrshire sold his ancestral estate of Linne or Lynd, and in May, 1532, bought a property known as Croftfoot near Dalry, Ayrshire.

His son, John of Croftfoot, sold the property in the reign of Mary, Queen of Scots, and the family went to settle in Edinburgh. John of Croftfoot's son, also John, married Mary Boyd from Pittfindie, and his son, the third generation of John, married Isobel Boyd from Forgil. They had five sons, one of whom, James, became a Merchant and Burgess of Edinburgh and married Margaret Smellum on the 9th February, 1707, at Edinburgh. They had two sons. The one James became the Physician at Haslar and the other John became a naval officer. James was born on the 4th October, 1716, in Edinburgh, the birth and baptism being recorded in the Register of the City Parish Church. This is the James Lind who will command our attention.

Another James Lind (1736–1812), who was also born in Edinburgh, trained as a physician, and also practised there, is said to have been a cousin and friend of his namesake the naval physician. The second James Lind also had talents as an astronomer, geographer and medical writer, was much travelled, and a surgeon in the India Company and also practised medicine for a time in India. He became physician to George III at Windsor and was a Fellow of the Royal Society. Confusion thus in mixing the honours and events in the lives of these two active gentlemen has often arisen, and close study of references is necessary to determine which doctor we are honoured to become intimate with.

In the records of the India Company appear two other surgeons named James Lind, who lived in that period and who are distinct from the Naval Surgeon and the Royal Physician.

To return to our James Lind, nothing can be elicited of his boyhood or schooling. However, on 22nd December, 1731, at the age of 15, young Lind became the registered apprentice to George Langlands, a member of the Incorporation of Surgeons of Edinburgh. Langlands studied under the famous Boerhaave (1668–1738) at Leyden University, and it is recorded in the Dictionary of National Biography that he was a Fellow of the Royal College of Surgeons [2], presumably of Edinburgh.

Another void in the story appears, and the next event of moment is that in 1739, when Lind joined the Royal Navy as a Surgeon's Mate on the declaration of war with Spain. His brother John was already an officer in the Royal Navy and this most likely influenced young James in his choice of Service. Of this phase which lasted nine years, until the end of the war in 1748, it is known that he served under Admiral Haddock at Minorca, and that his longest cruise was in H.M.S. *Salisbury* under Commodore the Hon. C. Edgecumbe, from 10th August until 28th October, 1746. He also sailed the Coast of Guinea and the West Indies and he visited Mediterranean and Channel Ports during the period of his service.

Leaving the Navy in 1748, he took up private practice in Edinburgh that year, after graduating on the 3rd May, 1748, with the M.D. of the University of Edinburgh. He petitioned the Royal College of Physicians of that City to grant him a licence to practise in view of his qualification, which was granted.

Two years later, on the 1st May, 1750, Lind was elected a Fellow of the Royal College of Physicians of Edinburgh, and seven years later he became Treasurer to that body.

The following entry appears in the *Scots Magazine* of 1756 [3]: " At the annual meeting of the Royal College of Physicians of Edinburgh, held at their Hall on 2nd December, 1756, the following gentlemen were chosen into the several offices of the college for the ensuing year, viz. Sir Alexander Dick, President; Drs. Adam Murray and Robert Whytt, Censors; Dr. William Cullen, Secretary; Dr. James Lind, Treasurer; Dr. Francis Home, Fiscal; and Mr. Henry Balcangual, Clerk." This post he resigned on being appointed Physician-in-Charge of the Royal Naval Hospital, Haslar, at Gosport, Hampshire, on the 1st June, 1758, succeeding Dr. G. Cuthbert, who was the first Physician of the Hospital which had opened four years previously. It is probable that he was offered this appointment because of his experience, knowledge and understanding of the nature and diseases of seamen.

At this point I would like to present an outline of his writings. The first effort, his Thesis for the M.D. Edinburgh, was written in Latin and given the title *De Morbis Venereis Localibus*. This early writing did not excite the Faculty.

That great product of his efforts, his *Treatise on Scurvy* [4], was written in three parts and contained an enquiry into the nature, causes and cure of that disease, together with a critical and chronological review of what had been previously published on the subject. The *Treatise* went to several editions, the second edition appeared in 1757 and the third in 1772. There were also two editions in French, in 1756 and 1775.

It is interesting to note that Tunstall (1937) [36] states that an ancestor of his, a Dr. Patrick Renny, born at Falkirk, Scotland, in 1734, and who studied and qualified at Edinburgh University, assisted Lind in the writing of his classic *Treatise on the Scurvy*. As the work was published in 1753, Renny would be but a youth of 18, and such a statement requires considerable support before it can be accepted as such, unless it is a later edition to which reference is made.

The next year, in May 1754, he wrote a paper on the possibility of lead poisoning arising from attempts at concentrating orange and lemon juices to a thick syrup, and which was afterwards stored in common lead glazed earthenware. He pointed out that as a result of the action of the concentrated acid on the glaze, a soluble lead salt was produced which was poisonous. The paper appeared in the *Edinburgh Monthly Magazine*. Thirteen years later, Sir George Baker developed this theory as the cause of " Devonshire Colic " when apple cider dissolved the lead used in the process for its manufacture and storage, by formation of similar acids.

Three years later, there was published *An Essay on the Most Effectual Means of Preserving the Health of Seamen in the Royal Navy*, Edinburgh, 1757. This work was dedicated to Lord Edgecumbe, under whom he had served at sea. Herein he repeats the conclusions of his first book with further information and suggestions on the means of prevention and cure of sea diseases, particularly that of "Ship Fever," introduced by "pressed" men into the Navy. This book went to three editions in English; the second edition in 1762, the third in 1774.

Included in the same volumes as the third edition of the *Essay on the Health of Seamen*, London, 1774, was a "Dissertation on Fevers and Infections, with New Observations on the Jail Distemper, and the Proper Methods of Preventing and Stopping its Infection."

A French edition appeared in 1758. This work describes fully measures of naval hygiene which should be practised in ships at sea, and includes direction for disinfection and destruction of vermin, of filtering water through sand in casks or by using charcoal, of the wearing of special clothes by surgeons who attended to the sick, and the ventilation and cleanliness of the sick berth. Before his day these matters received but scant attention except by a few enlightened commanders.

Boisseau (1824) writes on this publication—"*Opuscale qui a étè plus utile qu'il est remarquable,*" and this writer comments on the first great work, the *Treatise on the Scurvy*: "*C'est une monographie encore classique du scorbut, qu'il serait important de remêttre au courant de la science.*"

In 1763, there was published the *Two Papers on Fever and Infectious Diseases.* Creighton (1894) opens his Volume II of *A History of Epidemics in Britain*, with an opinion quoted from Lind's Paper on fever [5], to the effect that a chronological synopsis of the writings of the fevers would be a valuable book, and would bring forth treasures of knowledge, and thus inferred that the teachings of Sydenham and Morton would more clearly be perceived.

Of smallpox, not much was known in the army and navy in the eighteenth century, and Lind stated that in 1758 in the *Royal George* among 880 of a ship's company this disease caused the deaths of four or five persons and only left one hundred persons unattacked. The credited rarity of deaths in the services was due to the fact that few escaped the disease in childhood, and so did not succumb to further attacks. Thus natural active immunity was recognized.

When Lind was at Haslar, he wrote on the "Obstinate Agues and Bilious Cholic (Cholera)" which was prevalent at Portsmouth and Gosport in the autumnal season and was of epidemic severity. He states—"Since I reside here, I have observed those distempers to rage among the inhabitants and strangers and troops with an uncommon degree of mortality; while during the period of universal distress on land, 10,000 men in ships at Spithead remain unaffected with them" [5].

The ingenious methods to rid typhus from ships were often so successful that the ships too were destroyed in the process, as happened in many cases by fires caused by the use of mineral acids, the vapour being used as fumigants.

Less rigorous methods were tried, such as the installation of various ventilation systems, which fell in and out of favour rapidly. After a trial of several years in the wards of Haslar, where exhaust tubes for ventilation were erected in the hope of lessening the incidence of jail fever, Lind, whom Creighton (1894) quoted, concludes, "Experience must now have shewn that ventilation will not remove infection from a jail" [6]. Lind showed Howard in one of the wards at Haslar a number of sailors with jail fever, who contracted the disease on board the ship from men who had been discharged from a prison in London. It spread so rapidly that the ship could not put to sea and Lind remarked that the " Sources of infection to our Armies and Fleets are undoubtedly the jails ; we can often trace the importers of it directly from them. It often proves fatal in impressing men on the hasty equipment of a fleet" [6].

Simon (1890) stated that Lind did give his approval to ventilation contrivances, recognizing the need to rid ships, hospitals, barracks and prisons of foul air. The two most popular were the Hales' Bellows (called " Lungs "), a hand-operated mechanism which was supposed to both supply air to and exhaust it from a space to be ventilated, and the other was described by Samuel Sutton in 1742, who demonstrated how the copper boiler in a ship could be adapted to clear the foul air in the lower decks and holds of ships, by heat convection currents. This was given the popular name of " fire pipes." An amusing story is told by Lind [6] relating to Sutton's pipes, which had been fitted in the *Sheerness* bound for the East Indies. After a voyage of five months she arrived at the Cape of Good Hope without a sick man on board. All the good health was first ascribed to the " pipes," until it was found that by an error of the carpenter, the cock of the pipe had all the while been kept shut. One explanation of the absence of sickness was the adequate provision of a balanced dietary.

In Lind's *Treatise on the Scurvy*, he considered fully the history, nature, causes and cure for scurvy. The book contains a considerable chronological list, a Bibliotheca Scorbutica of all writings on the subject from 1534. He credits the Dutch physician of Gouda, Roussius (1664), for employing oranges and lemons as a cure for scurvy, and he noted that Sir R. Hawkins, in 1593, protected his crew on the *Dainty* from scurvy by appreciation of this fact. In 1600, Commodore James Lancaster, of the East India Company, had success with voyages to the Cape, and we know this sailor also emphasized the use of lemon juice. Woodall (1636) advocated lemon juice, too, states Lind. It is interesting to know that the Dutch had some sound foundations in the use of Sauerkraut as a prophylactic against scurvy. This was made from yellow cabbage, sliced thin and placed in a cask covered with salt and vinegar. The Dutch considered this substance had the same properties as orange or lemon juice.

Trotter (1792) [7] is quoted by Rolleston (1915), who states that while Trotter did not enthuse over Lind's ideas about a concentrated juice, he agreed with the use of fresh fruit for the same purpose.

It was Sir Gilbert Blane who so strongly advocated Lind's recommendations and was instrumental in 1795, on being appointed a Commissioner of the Sick and Wounded Seamen, to cause an Admiralty Order to be issued which made the distribution and use of lemon juice compulsory.

The effect of this order was seen in an analysis of the sick returns from the Fleet and naval hospitals, and as a result the annual average of the naval sick sent to naval hospitals was halved.

In 1797, Earl Spencer, First Lord of the Admiralty, being at Portsmouth, visited Haslar Hospital and asked to see a case of scurvy, but was told there was no case in the hospital to show him.

There has been speculation from his writings to construe the writer, and the author of a brief sketch was inclined to picture Lind as a " man of truth-loving and humane spirit, perhaps with something of the canny Scot in his respect for rank and authority, but independent in his judgment and fearless in expressing his opinions. He always appears anxious to give full credit to the workers who had preceded him, and he keeps himself in the background, except when necessary, to refer to his own experiences. He was evidently a man of extensive learning, but without pedantry ; his style, without literary pretence, is simple and lucid " [8].

It has been well said that the world knows nothing of its greatest men, and that is true of its foremost benefactors.

Lind, in the preface of the first edition of his *Treatise on the Scurvy*, writes : " During the last war, scurvy proved a more destructive enemy and cut off more valuable lives than the united efforts of the French and Spanish."

Lind wrote this *Treatise* because of the great interest in the subject excited by the narrative of the sufferings of Anson's expedition, which began in 1740, and where four out of five of his ship's company were lost in the harrowing two years. This story is briefly told in Part II of this paper.

The same editorial writer refers to his words contained in the preface of the *Treatise* wherein Lind states : " It was acknowledged that the best descriptions of it (scurvy) are met with in the accounts of the voyage ; but it was regretted that these were the productions only of seamen, and that no physician conversant with the disease at sea had undertaken to throw light upon the subject and clear it from obscurity under which it had lain in the works of physicians who practised only on land " [8].

In his summary of the collected writings and thoughts on scurvy covering the period of 200 years, Lind credits Roussius with the statement that Dutch Sailors had noted the benefits of fruit and vegetables on their cases of scurvy, probably by accident when they observed its excellent effects when returning from Spain loaded with fruit, especially oranges, which were eaten by the affected mariners.

When Lind's works were translated into French, his views were accepted by the medical profession throughout Europe, and as we now know, it was a year after his death that his teachings became established in his own country.

Though the use of lemon or lime juice as an antiscorbutic measure had been practised for some two centuries before his time, it is surely to Lind's credit that when recognizing its values from practical application rather than mere theoretical knowledge, he strove vigorously for its wholesale adoption in combating scurvy.

Rolleston (1915) believed that the reason for the fame of Lind, appreciated now only by a few historians, is due to his measures of preventive medicine and particularly the methods leading to the eradication of scurvy in the Navy by 1796, later in the Merchant Navy, and even yet later to the elimination of havoc caused by the disease in civilian life. This may well be contrasted with the state of affairs in 1779, when the Channel Fleet (under Admiral Anson) after ten weeks' cruise in the Bay of Biscay returned to Portsmouth with 2,400 cases of scurvy [9].

Smith (1919) writes that it was pointed out by Lind that " Officers are never or seldom affected with scurvy ; even subalterns and petty officers generally kept free from it while it commits great ravages among the common seamen" [10]. The reason was that officers carried their own " stores," and it was also within their means to dine well ashore and thus their diet was varied, whereas the men of the forecastle would prefer to spend what little money they had on beer and wines, and very little on salads and fruits, regarding these substances as inferior foods.

Huxham wrote from Plymouth in 1747 to the *General Evening Post* [11], when the Fleet under Admiral Martin returned after a voyage of only thirteen weeks with 1,200 men stricken with scurvy. He too advocated a vegetable diet and that ships should carry cider for general issue at sea.

On scurvy, Lind gave his opinions, based, as we saw, on a host of authorities and on his own judicious observations and experiments. As he pointed out, he was not the originator of the citrus fruit idea, but its staunch advocate.

Between 1541 and 1769, upward of eighty books or papers on scurvy were published.

Lind's specific remedies were dandelion, ripe fruits and lime or lemon juice in malaga wine, or with barley water, combined with acid gargles and mouth washes.

While at sea in the *Salisbury* he began an experiment which convinced him of the best course of treatment to pursue. He selected twelve patients all having the same symptoms of scurvy, and all in the " proper apartment for the sick in the fore-hold." The diet was the same for all, as stated by Taylor (1920) :

Breakfast	..	Water gruel sweetened with sugar.
Dinner	..	Fresh mutton broth, or light puddings or boiled biscuits with sugar.
Supper	..	Barley and raisins, rice and currants, sago and wine.

Two men received one quart of cider daily.

Two men received twenty-five drops of elixir of vitriol thrice daily on an empty stomach, and used a mouthwash and gargle.

Two men received two spoonfuls of vinegar, t.i.d., on an empty stomach, and again the mouth wash and gargle.

Two men received a half pint of sea water, t.i.d.

Two men received a concoction of garlic, mustard seed, horseradish, gum myrrh and balsam of Peru ; barley water and tamarinds to drink, with cream of tartar, all this again t.i.d.

Two men received two oranges and one lemon daily, for six days only.

The results were, according to Lind, favourable to those who took the oranges and lemons as these men improved with astonishing rapidity. Next best came the cider-treated cases. The elixir of vitriol was considered useful only for local treatment. In the light of present statistical methods and planned experiment, his very few selected cases, absence of control, and multiplicity of treatments would hardly be accorded much credit as far as statistical method or of the significant conclusion drawn. But for a young doctor, at sea, spurred on by an idea, under conditions on ship-board of that day, who can deny full credit to the adventuresome and scientific spirit of the man.

I digress here and join those who ask why Lind's recommendations were not followed until forty-two years later. One can but ruminate on the morsels of other numerous, invigorating measures, conjured up in the minds of honest, good men and published in their works. If a notion has the element of faddishness, it will, no doubt, be quickly taken on, given root and flower rapidly and bloom for a short-lived success to lapse slowly into obscurity. If a concept has real merit, it will show itself to a few readers and subject workers, and sadly hide itself for a century or so, and then, when a new savant presses for public recognition, the two may remain as an interlude background to the accepted and current local pride and prejudice, until a powerful personality produces a regulation, as an order or a law, affecting the procedure of the community—and then the general good is proclaimed loud and wide, and the now resurrected protagonist, whose zeal is most recent to the general memory, has a memorial erected over his vault or grave, and his name inscribed in the *Dictionary of National Biography*, and all is considered vindicated.

Another past painful replica of this point is seen in the story of Jenner and Vaccination, and of things yet to be—Strauss and his effort for compulsory pasteurization of milk.

We resume our story with the appointment of Lind as Physician to Haslar, which was approved by the Commissioners for Sick and Hurt Board, on the 25th May, 1758 [12].

The entry reads " Whereas we have thought fit to establish a Physician to the Sick and Hurt Seamen at *Haslar*, and to support *Dr. James Lind* of whom we have received good testimony to that employment ; these are, therefore, to direct and require you to cause him, the said Dr. James Lind, to be entered Physician of the said Hospital accordingly ; to hold the said place, and be allowed the salary of two hundred pounds a year, for his care and trouble therein until further order."

The three members of the Board were Doctor Hay, Mr. Hunter and Admiral Forbes. It was often the case that Admiral Lord Anson officiated as one of the three members of the Board, but was not present on this occasion.

Physicians to Royal Naval Hospitals were appointed differently from those to the Fleet, and were not recruited necessarily from those physicians who served in the Fleet. This method of selection was altered in 1805 by an Order in Council which decreed that Royal Naval Hospital appointments should be held only by those who served in the public service afloat.

In a letter to the President of the Royal College of Physicians, Edinburgh, soon after his appointment as Physician to the Royal Hospital, Haslar, as it was then called, Lind described his first impression, staff and organization. It is quoted by Stockman (1926) :

" To : Sir Alexander Dick, Bart.,
of Priestfield.

Dear Sir,

I received the favour of yours of the 17th July and am extremely obliged to you for the trouble taken to inform me of my accounts as Treasurer to the Royal College of Physicians in Edinburgh, being found in proper order and the balance properly stated and minuted in the College books.

I always esteemed myself extremely honoured by my Fellowship in that College, and shall endeavour to render the several members all the services in my power.

Haslar Hospital is an immense pile of building and tho' of brick will, when finished, have cost the Government about £100,000. It is surrounded by a high wall (to prevent desertion), contains thirty-two acres of ground. It will certainly be the largest hospital in Europe when finished, but even then will not be able properly to receive about 2,200 patients. This is owing to the largeness of the regular wards.

The annual expense at present is £14,000 per annum, but then we never have had above 1,040 patients, and this winter shall open wards for 500 patients more.

The Hospital is under the direction of the Physician and Council. The latter consists of the Physician who presides, two Master Surgeons, the Agent and Steward, and lately two new members are added to the Council, viz. Doctor Welch, Physician to Gorton Hospital (which receives the Marines only about a mile distance from us), and the Surgeon of that Hospital.

But this Council must act entirely by orders from the Board of Sick and Hurt.

Six Upper Assistant Surgeons at five shillings per day and four Under Assistants at three shillings and sixpence, were allowed, with an apothecary and two assistants, but it is proposed to reduce the number of Assistant Surgeons and increase the number of apothecaries, as these last are to be appropriated to visit with the physician in his wards. We are remarkably clean. No patient is admitted into the Hospital until he is stripped of all his clothes and well washed with warm water and soap in the tubs always kept for the purpose. He is allowed the Hospital dress during the time he continues in the Hospital or until his clothes are returned to him quite clean and sweet at the Government's expense. None of his clothes, bedding, etc., is ever permitted to be brought into the Hospital ; we have large outhouses for their reception.

In cases of fevers the patients' clothes are directly fumigated with Brimstone in the smoke house and baked in an oven sprinkled with vinegar. The fever wards are cut off from all communication with the rest and nothing but hospital dresses are used in them. We have sometimes ninety women nurses at a time. Their pay is £12 per annum.

In our wash-house we have seldom less than twenty-four women constantly employed. All these are under sober and discreet matrons.

We have about twenty labourers at one shilling and sixpence every day employed in the different branches of duty in the House.

I shall be glad at all times to have the pleasure of hearing that you are well. I beg that my best respects may wait upon Lady Dick and Miss, and that my compliments may be made acceptable to all the members of the College, believing that I am, with more particular regards, Dear Sir,

Your most obedient and obliged humble servant,
JAMES LIND.
Royal Hospital at Haslar, 3rd September, 1758."

I have left the structure as it was originally published, but have changed the punctuation and the spelling of a few words. It is interesting to observe his staff of surgeons being so many and his nurses so few. His isolation of the fever cases and his insistence in all cases of hygienic procedure for patients and bedclothes, in the attempt to make both " sweet," is distinctive of his method.

At Haslar, the medical staff could maintain as well a private practice which was unrestricted. During Lind's first two years of office there were *5,743* in-patients of which *1,146* were scurvy cases [13]. It has been estimated that during the Seven Years' War (1756–1763) he would have had between *300–400* cases of scurvy a day under his care, as it was quite usual for the Channel Fleet to arrive off Spithead and to discharge to Haslar *1,000–2,000* cases of scurvy. Thus, he had extensive experience and opportunities for carrying out the treatment recommended in his *Treatise on the Scurvy.* In the third edition of this Treatise, he wrote of his experience at Haslar. It may be said that he was certainly one of the earlier physicians to use experimental methods ; recording success and failure of the several remedies used on the cases in his care.

From his writings, Stockman (1926) believed him a man of wide learning and culture as evidences in Lind's handling of medical and historical writings and the method of making the synopsis of scurvy from all previous writings on the subject, which is a model of accuracy and fair statement, and which had not been attempted before in medical literature.

It is a matter for regret that we possess so little record of his more intimate, personal and mental characteristics. He was certainly modest and unassuming, and imbued with the true spirit of scientific enquiry [14].

In the preface of the First Medical Register [15], the editors express a desire to remain anonymous. Herein the name of Doctor Lind appears under the County heading and heads the list under Portsmouth, as Service Physician to the Royal Naval Hospital at Haslar. A description of the Hospital is given, which I quote :

"The Hospital stands on the west shore of Portsmouth Harbour near the entrance. It is a regular brick building, consisting of a front 567 feet, and two wings each 553 feet in length. Both the front and wings are composed of a double range of buildings, with an area between them, so as to admit, the wards having windows on each side, for a free circulation of air. It consists of eighty-four wards, each of which is sixty feet in length, and twenty-two in breadth ; a ward for consumption patients which is one hundred feet in length and fifty in breadth, and many smaller apartments. The wards for fevers, smallpox, measles and other infectious diseases are in each wing, separated by a piazza from the main building. Each ward has a water closet adjoining, which is supplied by a pipe from the reservoirs, and here another pipe communicating with the drains. The drains, which are built of brick, and arched, are kept clean by the sea, which is at every tide made to flow through them with considerable rapidity. Above these are the cellars, which are perfectly dry."

The remainder of the description is exactly as contained in Lind's letter to Sir Alexander Dick (*see* p. 9).

The entry in the Register is given as follows :

"James Lind, M.D. (Edinburgh). Fellow of the Royal College of Physicians of Edinburgh, and of the Royal Society of Medicine at Paris."

It is stated that he was also a Member of the Philosophical Society of Edinburgh.

The list continues with the next in seniority as follows :

"John Lind, M.D. (Son to the Senior Physician)."

and then :

"1st Surgeon : Mr. Robert Dods.
2nd Surgeon : Vacant.
8 Assistant Surgeons.
2 Under Assistant Surgeons.
Dispenser : Mr. William Shadbolt.
6 Assistant Dispensers."

In addition to his routine duties Lind interested himself in a simple apparatus for procuring drinking water by the distillation of sea water. In 1761 he designed a still, such as is very familiar in any laboratory. He used an "ordinary ship's boiler fitted with a pewter still head and a worm placed in a closed cask (worm tub or cooler) full of cold sea water which could be changed, and, when warm, utilized to fill the boiler" [9]. To remove the somewhat burned taste he advised exposure to air for a short while.

He gave a demonstration of this invention before the Portsmouth Academy and in May, 1762, before the Royal Society in London. Once again there was scant enthusiasm over this effort and Lind was to see another Naval Surgeon named Irving, ten years later, propose a much cruder apparatus for distillation, which was considered to be of sufficient merit to net the designer a considerable money award of £5,000 from the House of Commons.

In a short essay called, *A Means of Preventing a Want of Provisions at Sea,* written in 1768, Lind attempted to interest the authorities in the introduction of a nutritive substance by some easy means of production, which was stable and of small bulk, which might be carried on board ships and could be drawn on as a sort of emergency ration. This was intended to be in addition to normal victualling requirements. The ingredients recommended were a combination of powdered salep (meal) and dehydrated soup. His recipe was ; "An ounce of Salep and an ounce of portable soup dissolved in two quarts of boiling water made a rich thick jelly and provided enough food for a man for a day" [9].

His fertile efforts to aid the difficult lot of the sailor resulted in an idea by which eight men in distress for lack of drinking water could procure for themselves a pint each every three hours if possessed of a 5½ gallon boiler, a tea-kettle, a cask, a musket and the means of lighting a fire.

A letter was referred to in the Annual Register for 1768 [16], describing one ship that applied the method. The letter came from Brest written on 12th December, 1768, and states that the captain of the King's frigate *Eupouee* arrived there and confirmed the great utility of Poissonnier's method of making sea-water fresh ; his crew and himself "having drank several hogsheads of sea-water prepared in that manner without the least inconvenience." In brackets it is added that this method was "first practised by our countryman Dr. Lind, from whom the French physician has taken the process."

The contrivance was rigged by adapting the ordinary boiler on the ship by placing an inverted tea kettle on the boiler top and sealed round ; a gun barrel was fitted to the spout. This gun barrel could be kept cool by keeping mops frequently moistened and placed on it, or by passing the barrel through a cask of water.

Again there was no real originality in this field, as Stephen Hales, a clergyman (and engineer), in 1739, described a means of distillation of sea water to produce fresh water, and in 1753, Joshua Appleby, a Durham chemist, used calcined bones and lapis infernalis or silver nitrate to assist this operation. The Admiralty published details of the process in the *London Gazette* of 22nd January, 1754, for information of the Services [23].

Later in 1768, the *Dolphin*, in a voyage around the world, between Batavia and the Cape, procured forty-two gallons of fresh water from fifty-six gallons of sea-water in five hours and thirteen minutes, at an expense of 9 pounds of wood and 69 pounds of coal. Each man on board received one quart of the distillate.

In his *Essay on the most Effectual Means of Preserving the Health of Seamen in the Royal Navy* [17], there is a recommendation that seamen should be " put into a uniform sea habit with some little movable badge or variation by which it might be known to what ship they belong," quoted by Rolleston (1915), the object being to ensure cleanliness and to avoid infection by the wearing and exchange of filthy articles of clothing. This topic was later elaborated by Trotter (1797) [18], who added that such a uniform would render desertions more difficult.

The familiar uniform of sailors was established in 1857; officers' uniforms, however, became a regular feature in 1825.

Even more than the number of cases of scurvy in the Fleet were those of " Fever," the various types of which were grouped all together under that heading.

At Haslar, Lind stressed the importance of fresh air and ventilation, and insisted on airy wards where fever cases were nursed. As well as fresh air and cleanliness in preventing the spread of infection, he advised fumigation in wards by burning charcoal fires strewn with sulphur or arsenic.

Jail fever (typhus) was common in the Fleet, believed to be introduced by impressed men brought from prisons, and again Lind recognized the significance of infection by contact and by old clothes, and thus advised disinfection by the heating of these articles with the hot air of an oven. He suggested the adoption of " Slop Ships " where recruited men, before being drafted to the Fleet, were to be inspected, and their clothes disinfected after they were cleaned, to prevent their carrying infected material into ships.

In 1768 he wrote *An Essay on Disease Incidental to Europeans in Hot Climates*, which dealt with prevention and cure of tropical diseases and with the climatic influences on disease.

In this paper he advised the use of hospital ships for the sick rather than the use of hospitals on shore, and decried the indiscriminate use of venesection to those persons who had recently arrived in the tropics, as a method of acclimatizing them. There was an appendix added concerning intermittent fevers as well as a section on the distillation of salt water to render it fresh, and also a suggestion on how to prevent the scarcity of provisions in long voyages at sea.

Lind was close to the solution of the means of spread of malaria, when he suggested that the gun ports should be covered and screens erected on the side receiving an off-shore breeze. He did not associate the disease with the mosquito, although he was aware of the need to avoid anchoring near swamps, the use of smoke, and of the need for off-shore living quarters which he termed "factories," because of the danger that lurked in the night air of the West Africa Coast [19]. This publication ran to six editions, and the work was a valuable summary of the diseases then prevalent in each British Territory. Lind described directions for the avoidance of these afflictions. He recommended the use of cinchona bark for the treatment of malaria, as did his predecessor, Sydenham, and his advice for people to live on high ground away from stagnant water was sound, although he was unaware of the true source of infection.

There were two French editions of this work in 1788 and 1792, and Boisseau (1824) writes: "anorage lucare classique, mair vieilli, sur les maladies des pays chauds, analogue a celui de Pringle sus les maladies des armees."

Trotter remarked (1792): "The leading trait of his professional character has marked him the man of observations" [7].

This disciple wrote in 1797 [20], "Dr. Lind may be justly styled the father of nautical medicine."

Allison (1943) stated that Charles Fletcher (1786), Surgeon to H.M.S. *Roebuck* in 1775, quoted Lind's works repeatedly, and personally wrote of his "goodness of heart" and called him "that excellent man."

Lind was regarded highly by his associates and was respected for his gentle and unassuming manner, and distinctive professional ability.

Thompson (1790) [21], a contemporary writer on scurvy, had this to say of his senior, "Among the publications which have appeared on the scurvy, a Treatise written by the judicious and indefatigable Dr. Lind stands foremost—indeed it appeared to me, when I just read it, to comprehend everything worthy of notice in the disease; and to have entirely exhausted the subject. But notwithstanding the high estimation in which that work was, and still most deservedly continues to be, held, yet many publications have since appeared which treat of scurvy, and which have in general, contributed to the perfection of the preventive and curative plans."

The author thus makes room in the medical literary field for his own estimable work.

It was Lind who dispelled the teaching of Dr. Engalenus whose writings held sway on the subject of scurvy, and which was confusing. Lind focused thought and knowledge already gleaned from materials on the subject covering the previous two centuries, and by his own views, which were supported by his experiences at sea and in hospitals, propounded that green vegetables and fresh fruits were not the whole prescription for prevention of this disease. It is not generally appreciated that he considered overcrowding, dampness and generalized depressions of spirits as abetting causes which could be conducive to the spread of scurvy.

Walker's (1930) view of the reason why his teachings did not give rise to immediate changes in official procedure, maybe in part due to Lind's "lacking of dominating will power necessary to enforce his views on those in authority, or it may have been that he was too far in advance of his time for his ideas to be accepted readily." I favour the latter view as established opinion and current practice of that day did not permit alteration of the accepted view, and any innovation was criticized to such an extent that but very few could recognize the merit of any steps of real advance in the March of Medicine, so loud was the clamour of all attempts, good, bad and indifferent, on this peculiarly rocky road.

His successors, Blane and Trotter, however, both understood his meritorious probings. The order that followed Blane's recommendation of a ration of lemon juice in 1795, to be supplied to a few ships voyaging to the East Indies, showed a result twenty-three weeks later, whence came a report from the Flagship on arrival at Madras, which stated that not a single case of scurvy had occurred.

What Lind saw clearly is commonplace to-day, but was generally unthought of in his time, so that his teachings provided for the strength of the Royal Navy to be maintained, and gave his successors a substantial background against which to continue, during times of war and peace, the practice of the science and art of preventive medicine.

Lind was considered by Simon (1890) as one " of the Roll of the Fathers of our Modern Preventive Medicine " who have followed on in the steps of Richard Mead (1673–1754) and Sir John Pringle (1707–1782). He had a declared object, writes Simon, which was to provide " a plan of directions for preserving the British Seamen from such distempers as prove much more fatal to their corps than all the other calamities incident to them at sea. The number of seamen in time of war, who die by shipwreck, capture, famine, fire or sword, are but inconsiderable in respect of such as are destroyed by ship diseases and by the usual maladies of intemperate climates " [22].

Of his work, I quote from Simon (1890), who continued to say : " The fact that scurvy, which used to cripple fleet after fleet, and to waste thousands on thousands of the bravest lives, has since the days of Anson's expedition, become an almost forgotten disease, is due emphatically to Lind ; and to him therefore, even thus far, we owe much saving of human life as probably no other one man except the discoverer of vaccination. Then as regards typhus, the value of his preventive teaching has been scarcely less conspicuous : for the circumstances of his official position gave him singular facilities out of which to corroborate Pringle's belief of the identity of ' hospital fever ' with ' jail fever ' and ' ship fever ' and to illustrate the laws of that many named infection ; and the system of rules which he laid down for limiting its ravages in ships and populous establishments is one to which our after times have made little or no material addition, and to which we no doubt are in great part indebted for our comparative freedom from epidemics of typhus."

Lind recognized remedies and urged improvements, but was almost overwhelmed by the situation confronting him, as he lived in surroundings that had scarcely bettered, hygienically speaking, since the days of the Tudors. He believed that a marked contribution to sickness was the too strict adherence to old regulations and customs and pointed out that the practice of washing decks after sunset caused the decks to remain damp during the night. He advised that in wet weather decks should be scraped and swept, not washed, and fires should be lit in braziers to dry them. But this was an all too troublesome procedure as well as being an accredited menace to safety. Yet even on dry days, ships were damp because of their methods of construction whereby the massive timber underwent prolonged " pickling," supposedly to prevent rot, which it didn't, and so on launching, ships were often water soaked and mouldy. Naval architecture was a hidebound art and change was very slow to manifest itself.

Concerning food, Lind urged fresh provisions to be carried and fresh bread to be baked on board. The bread, in particular, he believed best suited to assist the diet of scurvy cases, as they could not chew the hard biscuit which was an unpopular item even for the healthy seamen. This biscuit weighing about four ounces was made in round pieces with a centre hole and composed of mixed wheat and pea flour. The bread, which he advised instead, could be advantageously allowed to the sick and would not upset the economy or business of the ship, nor cause inconvenience if made on board. The French men-of-war, he pointed out, carried livestock, fowls, eggs and vegetables which were distributed to the sick under direction of a surgeon. In the British Navy, such luxuries were carried for the officers, and were either begged off them or were voluntarily contributed when some urgent need for these articles arose. The livestock was carried in pens in most of the ships on the main deck of first raters, or on the upper deck of second and third raters under the boom of the foremast. The officers were very generous toward the sick and wounded, but Lind sought proper provision instead of casual and chance charity.

He showed how pot-herbs and vegetables could be preserved for reasonable periods by successful experiments.

His insistence of careful scrutiny and recording of findings of new recruits and those sailors joining a new ship in a way anticipated the keeping of regular record cards or medical history sheets. It was considered desirable to know of the man's former occupation, his last place of residence, present state of health and, if a sailor, the state of his health on the last voyage.

Realizing that untrained men required seasoning to the hard way of life at sea through gradual stages, and that as recruits were more susceptible to disease ashore and could possibly cause the transmission of infection to a ship newly joined and thus become a menace to the health of the rest of the personnel, he advocated the adoption of clean and ventilated guard ships. Here " ragged and suspicious persons whether pressed at sea or on shore " [23] should be quartered for at least fourteen days, and there they were bathed and given new and clean clothes, whilst the old clothes were destroyed.

Another hygienic measure was the insistence of the regular monthly scrubbing of hammocks. He condemned overcrowding, and it is pointed out that a first rater of say *2,000* tons, which was *180* ft. long at the lower gun deck level, carried from *800* to *950* on board. Third raters of *1,300* to *2,000* tons and *160* ft. long carried *500* to *700* men. Consider too that ships of *40* to *75* guns required eight men to handle a gun and four men to operate a carronade and we see the reason for the overcrowding.

More men than were immediately necessary to work the ship or guns were carried to act as reserves because of anticipated battle loss and mortality due to disease when long voyages took place. In a way, then, the overcrowding caused a portion of the high overall mortality it was intended to offset.

Those familiar with the habits of "Captain Hornblower" when at sea, will recognize a similarity in the spartan principle Lind believed in, that cold baths and frequent exercising had great value in increasing vigour and resistance to disease.

One of our present problems in hospital, and receiving the attention it deserves, is the prevention of cross infection and one of the principles of avoidance is fresh air and adequate ventilation of a sick bay or hospital ward. Lind considered this essential matter. His idea of the best situation of the sick bay in a ship was the forecastle in preference to holds and gun-decks, as this position could then be segregated from the rest of the ship's company. Canvas and boards could then be erected, he pointed out, as protection from wind and rain. If too many infectious cases arose, and if that part was needed for the working of the ships then the gun-room was considered next best, as it was an accessible locality and could be kept cleaned and aired with the gun ports open. If permission to use the gun room was refused, then the cockpit must be reverted to and ventilation pipes should be used if bad weather forbade the opening of scuttles or port-holes, which should be cut into the outer bulkhead. Another feature was that all unnecessary furniture should be shifted away and no large gatherings of sailors in the vicinity should be allowed. He insisted on careful daily cleaning of all feeding utensils and water buckets. Fumigations were in great vogue, and vinegar, burning tar, pitch, nitre and gunpowder (containing sulphur and nitre) were the favourites in use. Patient's clothes were also to be washed as well as fumigated. There was to be adequate hammock spacing and the infected patient separated from the non-infected. Surgeons visiting a contagious case were to wear a suit of clothes reserved for the purpose, which should be a waxed linen garment, which Lind considered superior to woollen ones. Attendants on the sick should wear painted canvas jackets which could be easily washed.

On the question of infection arising from contact with soiled linen, Trotter (1797) states that Lind recognized that nurses of the hospitals knew well that there was greater danger of catching fever when piled heaps of bedclothes or underclothes did lie together for a few days before being carried to a wash-house than when washed straight away. He adds that the washer-woman too recognized the bad smell of the unwashed clothes, reconciling it with the fact that it was associated with cases of a dangerous fever in the hospital, so that they aired the clothes until the smell was gone, and then washed them with safety. If this was not done " because of hurry or neglected by design, many of them were seized with the sickness." Lind was in favour of the " fumigation process, for drying linen and destroying noxious matter." Boiling water he believed was not enough, and considered that "dry heat for clothes and burning sulphur for rooms was by far the best method of disinfestation."

When cases were discharged to shore hospitals with their gear, all bulkheads were washed, using a good stream of water so that cracks and crevices would not escape, and then the compartment was to be sealed and sulphur burned for two hours : next all the scuttles were opened so that a good current of clean air could pour in and thus the quarters were again made fit for habitation.

The treatment Lind suggested and practised for men recovered from the sea suffering from degrees of drowning was different from the established practice of holding these unfortunate men up by the heels in an attempt to rid them of water, and restore breathing. He laid them down, wrapped them in blankets and while one assistant blew into the man's mouth, another massaged his limbs, and yet another assistant exerted gentle and rhythmic pressure and release of pressure against the man's ribs. This practice resembled the present-day regimen of Schäfer's method of artificial respiration [24].

He further recommended a recovery place or berth for convalescents, and again before admission there, the sailors were to be bathed, given new clothes and their bedding disinfected.

The mental outlook of the sick was not neglected by this good man. He realized the importance of keeping up the spirits of the ailing, by having attendants of cheerful dispositions and the sick to be furnished with amusements. The officers were prevailed upon to promote this amusement. At a later date, it was Lord Nelson who introduced ship theatricals.

Inured as the seamen were to hardships, sickness and death, Lind maintained that the dead should be removed quietly and privately to a convenient place, before burial at sea.

He directed that when a case was to be transferred to hospital, the surgeon should acquaint the hospital officials as to the nature of the case prior to landing him, so that he may be assigned to a proper and distinct ward. Hospitals, he urged, should have separate wards for different types of diseases.

About uniform dress : he strongly appealed for the introduction of a uniform and of a regular issue of clothing to the newly joined. This, he said, would permit the discarding and destruction of dirty and infected clothing and contribute in many ways to health and morale. This he suggested in 1774 and it was adopted in 1857. Dress, until that last date, was a matter of fancy on the sailor's part or dwelt on the Captain's particular notion as to style and colour he felt best suited to the whole or part of the ship's company. Very often the Captain provided his cutter's crew with some type of uniform or to the whole crew if he was a wealthy man. Generally a large part of the crew were given uniform on ceremonial occasions. However, certain features were universally popular, as the blue-jackets carrying buttons and ribbons of various colours, wide and fully-made white or striped trousers and low quarter shoes with silver buckles. (Of surgeons it is believed that they did not wear a distinct naval dress until 1805, and uniforms for officers were not general before 1825.)

Lind was plodding, painstaking, methodical and precise, stated Taylor (1920), writing that Lind was able to carry unbroken for fourteen years a single Fahrenheit thermometer, taking temperature observations everywhere. He goes on to say of Lind that, "There is feeling of candour, but no visible acrimony, and not a word too much in his claims to priority or originality in various schemes, and in his comments on the rewards that went to less deserving people who had better opportunities to attract the favourable notice of parliaments, councils and committees."

Lind resigned his post as Physician-in-Charge of Haslar Hospital on 30th June, 1783, after twenty-five years of service, to be succeeded by his son John, whose first appointment in the hospital had been that of an Assistant Surgeon on 26th February, 1772.

In 1783, Sir George Chalmers painted his portrait. An etching of this was the frontispiece to the sixth edition of his *Essay on Disease Incidental to Europeans in Hot Climates*, 1808, and which has since been reproduced in most historical textbooks or subsequent articles referring to Lind and scurvy. Commenting on the etching Balfour (1925) states he looks much better tempered than Pringle, his compatriot and Army counterpart, and that he has an intelligent and benevolent aspect. He sees in the etching a trace of humour about his mouth and adds that, "assuredly he had need of humour in days when the Navy answered to the terrible description given of it by Smollett." Of his writings, Balfour believed that Lind was a "clear thinker, an accurate observer, and a sound clinician. Like Pringle, he was a fine man, wise, sagacious and broadminded, courageous also, and with a great heart."

Lind did not receive any special honour because of his writings and work in his own country, and it is not stated that he did receive any distinction from other countries other than that noted in a privately published book, largely the work and editorship of Andrew Duncan, M.D., at Edinburgh, during the latter half of the eighteenth century.

I quote an entry from the *Medical Commentaries* [25] that mentions the top-ranking names of medicine of the day, and the honour that they received :

> "The following gentlemen have been lately named foreign members of the Royal Society of Medicine established in the course of the last year by an Order of Council at Paris (1776) :
>
> Sir John Pringle, Bart., Med., Reg.
> Sir George Baker, Bart., Med., Reg.
> James Lind, M.D.
> Thomas Percival, M.D.
> Thomas Glass, M.D."

Lind was an original Fellow of the Royal Society of Edinburgh, but this honour came to him automatically as a member of the Philosophical and Medical Society when that body was amalgamated by Charter in 1783 to the Royal Society.

The great teacher died at Gosport, Hampshire, on the 18th July, 1794, and an obituary notice appeared in the *Medical Commentaries* [26] which recorded the events of 1794. Herein it is noted that Lind held the office of Physician to Haslar Hospital for many years with much credit to himself and benefit to the public. His valuable publications made him well known to the medical world. Other similar obituaries appeared in the *Gentleman's Magazine* [27] and the *European Magazine* of 1794.

His remains are in a vault under an old Norman Fount at St. Mary's Parish Church in the grounds of Portchester Castle, Portchester, Hants. A memorial tablet is erected to his memory in the church which reads :

> " *Non Omnis Moriar* "
> " Here lie the remains of James Lind, M.D., who was twenty-five years Physician of the Royal Hospital at Haslar. He died on the 18th July, 1794, in the 78th year of his age."

On the footpiece is the inscription :

> " Also to the memory of Isobel Dickie, relict of James Lind, M.D. Died March 6th, 1797. Age 76."

The Parish Register [28] for that period contains the two entries :

> " Burial, July 22nd, 1794. Dr. Lind of Gosport."
> " Burial, March 11th, 1797. Isobel, Widow of James Lind from Gosport."

There was an unsuccessful attempt by Sir T. D. Gimlette, one time Inspector-General at Haslar, to transfer the memorial from Portchester to St. Luke's Church in Haslar Hospital grounds.

When Blane corroborated the work and teaching of Lind in his own *Observations on the Disease of Seamen*, 1785, and was later (1795) appointed Commissioner for sick and wounded, and Chief Officer of the Navy Medical Board under the Admiralty, he had an opportunity of instituting the naval medical reforms Lind advocated. Early in 1796, two years after Lind died, the order was in force which allowed every man of the Fleet an issue of lemon juice as a prophylactic measure against scurvy. In so doing, Blane gave full credit to Lind's efforts and shortly after the order came into force cases of scurvy diminished rapidly from the official returns.

Tunstall (1936) writes of Lind's reforms being adopted by his junior contemporary, Blane, who succeeded in giving his predecessor's teaching administrative effect through his friend and adviser, Admiral Rodney, and through his own able manner in expressing their views clearly.

It is to be remembered by Service medical officers that Blane advocated the necessity of improving the status of naval surgeons, and to have their work supported by executive officers which is still of prime importance. He considered a qualification for this would be for the recruitment of medical men who could command respect and demonstrate the qualities deserving of a degree of personal prestige.

On the wonderful trio, Lind and his disciples Blane and Trotter, Balfour (1925) states aptly : " Men thrown up by the ever-recurring wars with France to initiate, guide and control medical and hygienic progress in the navy." He also recognized the richness and reality of the lives and labours of these early warriors of hygiene and reminds those who have visited on board the *Victory* at Portsmouth, to recall that guided tour of the ship in harbour and then to picture those men of another day living, working, reasoning and writing in the bilge-smelling bowels of these ships of the line.

Part II

In Part II we return to the events of the period of Lind's service as a Surgeon's Mate and then to the historical circumstances which wove a pattern that embraced and influenced the course of preventive medicine in the Royal Navy.

In March, 1741, Vernon commenced the assault of Carthagena. Under him on this occasion was H.M.S. *Cumberland*, and serving as one of the two Surgeon's mates was Tobias Smollett, better known later as the author of the *History of England*.

Smollett describes in one of his novels, *Roderick Random*, an account of the battle and the part the Surgeons played in the performance of their duties in the cockpit and on deck in the heat of that engagement. (Callender (1943) considered the exaggeration and caricature with which Smollett treats his subject as regrettable since he believes that, with Smollett's literary gifts, he might well have produced a remarkably interesting history of the contemporary naval medical service.)

In the absence of more informative literary efforts by contemporary serving naval surgeons the following summary could be assumed to approximate the state of affairs that existed on board a ship in which Lind served that very year.

Vice-Admiral Vernon, after a Council of War, decided that five of his largest ships should bombard the Fort at Carthagena on one side, whilst a fascine battery, erected after a successful landing party three weeks before, could engage it on the other. The night before the action all ships were informed.

The Senior Surgeon of the *Cumberland*, who believed the cockpit the least vulnerable site in the ship until he heard of a Surgeon's mate killed there in a previous skirmish, insisted on a platform being raised for the sick and wounded in the after hold ; but before this could be made the ship weighed anchor and proceeded to anchorage before the Castle of Boca Chica and the cannonading began. Smollett and the other Surgeon's mate arranged the instruments and dressings necessary for the casualties. Acting as assistants, the Chaplain and the Purser took up stations in the cockpit.

In a few minutes a casualty was carried down and proved to be dead on examination. Another, a friend of Smollett's, came down with a shattered hand, and this man bore his misfortune with calm courage observing that he could not complain at all if the shot had found his head, and, even if it had, he would only have settled a debt that every man owed, and which must be paid some time or other. This staunch sailor bore the trial of an amputation without flinching, and whilst Smollett was dressing the stump, the other commented on the progress of the battle and criticized the ship's gunnery.

By now patients became numerous and the surgeon fortifying his weakening resolve with a nip from the rum bottle, which he passed to the chaplain and purser, went above on deck to care for the fallen there, whilst the purser sat in the cockpit haranguing his poor judgment in leaving a prosperous brewery at Rochester for this wretched business of war.

Historically this attack was a failure—due primarily to Vernon's blustering manner and bad temper as well as to a high incidence of sickness amongst the soldiers (an epidemic of some sort broke out killing numbers of them and wasting the strength of those whom it failed to kill).

Mahan (1897) points out that another reason for their failure is due to the quarrels which arose between the Admiral and General Wentworth, in command of the soldiers, because of each other's misconception of the other's business.

In 1744, France joined Spain against Britain and finally, in 1748, the European War ended with the Peace of Aix-la-Chapelle. The results of the war have been tersely summarized by Mahan, who writes : " never perhaps, did any war, after so many great events, and so large a loss of blood and treasure, end in replacing nations engaged in it so nearly in the same situation as they held at first " [29].

Although this war ended without achieving much purpose, the great captains of the Navy met with adventures and experienced the deplorable result consequent on the absence of a satisfactory hygienic state.

Simpson (1915) comments that the advances in sanitary progress of the Navy were slow and fitful, and associated often with deplorable setbacks, for they depended much on the views of individual captains and officers, some considering that the reforms advocated would lead to effeminacy. It is apparent, however, that the great captains, Anson, Rodney, Howe, St. Vincent, Nelson, Collingwood and many distinguished Commanders, too numerous to mention, were solicitous regarding the welfare of their men. The story of their adventures have never failed to stir the imagination of those who read them, and many of these sea heroes owe to Lind, directly or indirectly, some measure of credit for their successes.

As the misfortunes of Anson's voyage in 1740 are said to have kindled the desire in Lind to study and alleviate the calamities that befell seamen on long exploratory and campaign voyages, and led to the writing of his work on scurvy, I would like to briefly present this epic naval feat.

On the 18th September, 1740, eight vessels left England on an expedition to the West Coast of South America, called the " Spanish Coast of the South Seas." The Commodore of the Squadron, Captain George Anson, wore his flag in the *Centurion*, of sixty guns and four hundred crew.

The other ships and Commanders were :

The *Gloucester*, fifty guns and three hundred crew. Commander, Richard Norris.

The *Severn*, fifty guns and three hundred crew. Commander, Hon. Ed. Legge.

The *Pearl*, forty guns and two hundred and fifty crew. Commander, M. Mitchell.

The *Wager*, twenty-eight guns, one hundred and sixty crew. Commander, Dandy Kidd.

The *Trial*, eight guns, one hundred men. Commander, Hon. G. Murray.

There were two Victuallers, transports to carry stores, the *Anna* and the *Industry.*

The ships were sufficient for the objects which were prescribed to Anson, but the crews were utterly unfit for that or any other enterprise requiring courage and endurance, or even bodily health and vigour. Not only was every ship short of her complement, but of those embarked, numbers of men were drafted out of the hospitals. Some men were half-cured of their wounds or ailments, some not cured at all, and some, through age, wholly incapable of being cured. One man had actually been wounded at the battle of Boyne, fifty years before.

It was rather a relief than otherwise that half of these invalids deserted before the expedition set sail.

The task given to Anson was to attack and distress the Spanish anywhere at sea or on land; to seek the friendship of the natives of Chile and enlist them as allies against Spain; to attack Callao and, when in Peru, if he could cause revolt so much the better; to capture Spanish ships trading between Lima and Panama, and to destroy Panama; to capture the Spanish Acapulco Galleon, which sailed for Manila from Panama and, finally, to return home by Cape Horn or the Cape of Good Hope, according to his judgment, after leaving some of his ships for the security of any acquisitions he might have been able to make.

Such an assignment would require at best a complete crew and equipment, and both were deficient, yet the mission was accomplished by Anson's peculiar talent, as Yonge (1863) writes, "by inspiring confidence in, and obtaining influence over one's fellow-men, which of all gifts is the most indispensable for the performance of great actions."

The difficulties were monumental; rough passages due to violent equinoctial storms in the South Atlantic which reacted on the initial feeble health of the crew, followed by sickness of epidemic nature killing many, and, of the living, eighty on board the *Centurion* alone were wholly disabled.

After landing the invalids on the Island of Santa Catarina, for their recuperation, repairs to the ships were carried out with due regard to altering the ventilation. However, instead of recovering on the Island, the cases of sickness and number of deaths increased. It was not until January, 1741 that Anson put to sea again and two months later entered the Pacific Ocean. Storms again assailed them and lasted for two months, which scattered the Squadron, half of which never rejoined.

By May, the *Centurion* ship's company was half of that when they left England. Over two hundred had died and half of the survivors were left so weak by disease that they could not perform their ordinary duties.

Later the *Gloucester* and the *Trial* joined the *Centurion*. They were in the same plight. The three ships in company anchored in the harbour of Juan Fernandez, the island of Defoe's story of Robinson Crusoe, founded on the adventures of Alexander Selkirk.

The abundant good food of this island restored the strength of the sailors but slowly, and it was three months before the nourishing diet and rest permitted them to weigh anchor again—a year after leaving England.

The three ships had barely one-third of their original crews left. On leaving England they numbered 969 men and boys, and now they were 214 men in the *Centurion*, 82 in the *Gloucester* and 39 in the *Trial.*

Still, undaunted, this indomitable sailor set out once again to accomplish his given orders. The three ships parted company once more, each to seek out, in various directions, some prize, which they did, capturing two each. Anson concentrating on his task in hand, captured and sacked Paita, a coastal town in Chile. His next move was to direct his efforts to capture the great Acapulco Galleon, as Vernon's failure at Carthagena made an attack on Panama unwise at that juncture. In preparation for that adventure, he abandoned two ships and added the crews of the *Gloucester* and *Trial* to the *Centurion*, and even so it was but half her full complement. At Quito he was supplied with turtles, which were considered a wholesome and nutritious article of diet. After a while at sea, again scurvy spread, attacking Anson as well. Many deaths occurred, and in an enfeebled state they barely managed to navigate the ship on a line which the galleon to Manila was purported to have taken.

In August, 1742, they reached Ladrone Islands, and anchored off Tinian, the largest island. It was Spanish, but they provisioned themselves with all kinds of cattle and birds, vegetables and fruits. Of fruits, the bulk grown were oranges, limes and lemons. " These last," states Yonge (1863), " indeed to the sick and almost dying sailors, proved the most beneficial of all."

While Anson was ashore here one day with most of his crew, a sudden gale sprang up and caused the *Centurion* to be cast adrift from her moorings. She was driven, with only a few of the crew aboard, out to sea. Fearing she was lost, Anson with his astonishing resolution prepared to refashion a local barque to withstand a voyage to China where he proposed to go to gain a passage back to Europe. Whilst the work was proceeding, after nineteen days the *Centurion* returned, to Anson's intense delight. Intent on the interception of the Spanish Galleon, he hurried the refitting and victualling of the ship and then sailed for Macao, where he arrived in November and decided to spend the winter there. Although Macao was Portuguese, the Chinese influence was great and they did not at first assist in the provisioning of his ship until he took a firm hand in the matter, when the Cantonese changed their tune and provided his needs.

Setting sail again in April, 1743, they bore eastwards. By now the crew totalled only 201, including officers, men and boys, and the able seamen numbered about 45 in all.

On the 20th June, the long and patient vigilance was ended for the Galleon was sighted. She was named the *Nuestra Sen Hora Del Caba Danga*, wearing an Admiral's flag and manned by 550 of a crew and had an armament of 70 guns. A fierce battle ensued which lasted one and a half hours and finally Don Montera, the Spanish Commander, struck his flag. The large number of prisoners caused Anson to make for Canton where he landed them, and sold his prize. The Chinese honoured him because of this success.

His mission completed, he set a course for England in December, 1743 and, after a voyage of six months, anchored off Portsmouth.

The incredible adventure and demonstration of courage, resolution, skill and fortitude earned him everlasting fame.

Hannay (1909) wrote in praise of him " Stern but just, asking no affection but deserving it, and commanding absolute confidence, veritably a flower and pattern of all bold mariners."

As to the fate of the other ships, the scuttling of the *Gloucester* and *Trial* was previously noted.

The *Severn* and the *Pearl* with the two supply ships, after a series of mishaps, were nearly taken by a Spanish Fleet in the Atlantic, and returned to England having lost the greater part of their crew from sickness. The last ship, the *Wager*, was wrecked on a desert island after leaving the Strait of Le Maire and the crew endured the miseries of foul weather, want of food and clothing, and a harsh captain. One of that party, a Lieut. Byron, grandfather of the poet, recorded their trials. Thirty men of that unfortunate group deserted in an attempt to reach Brazil, whilst the Captain, Byron and two Midshipmen, the only remaining survivors, reached the Spanish town of Castro. They were taken prisoners and placed on board a French ship bound for Brest, when it called at Valparaiso. On arrival in France, the Madrid Government ordered their release and they finally arrived in England in November, 1745, a year and a half after Anson's return.

Of the more shining examples of adherence to the hygienic principles advocated by Lind can be included the chronicle of Sir Edward Hawke, who, in Command of a British Fleet in 1759, blockaded the French off Brest. He gained the well-known victory of Quiberon Bay, and to the acceptance of Lind's advice it may be credited that of the 14,000 men under Hawke's command for the several months of the Blockade, he insisted on a regular supply of vegetables and fresh provisions to be sent to him regularly from England, and it was noted that on the day of battle there were not twenty men sick in the whole fleet.

Others who adopted Lind's advice and noted his teachings included Captain Sir Hugh Palliser, friend of Captain Cook, and Mr. Pelham, Secretary to the Commissioners of Victualling, who provisioned Captain Cook's vessels, the *Resolution* and the *Adventure*, which started the adventure of the second voyage around the world, on 13th July, 1772 [24].

Scott (1939) states that Cook wrote from Dusky Bay, New Zealand, and informed the Admiralty that after he had sailed 3,660 leagues, without once sighting land in 117 days at sea, there was on board but one case of scurvy. Sweet wort was given to those showing signs of scurvy on board his ship, the *Resolution* (462 tons).

Cook adds that it was interesting to note that as they had a few goats and sheep left which they expected would be hungry for the vegetation ashore, they observed that the animals made no attempt to eat the grass, and it was found that their mouths were sore, with gums swollen and teeth loose. It was they who had symptoms of scurvy, being deprived of green feeding stuff.

The *Adventure* (336 tons), whose Commander, Captain Furneaux, did not report the same success with his crew, since they were not given the prophylactic antiscorbutics, either because of ignorance or laxity in enforcing Cook's orders. They had one dead and twenty sick with scurvy and several more were showing signs of illness, but were cured when given treatment which consisted of a mixture of marmalade of carrots and the " rob " of lemons and oranges.

In the summary of the voyage lasting three years and eighteen days, under all changes of climate, Cook lost four men altogether and only one on account of sickness. He attributes this to the provision of a quantity of malt to make sweet wort, and any sailor showing signs of scurvy received 1 to 3 pints of this daily. Another item was sauerkraut, of which he had a large quantity, and which could be kept well preserved. This was given to the men as an issue —a pound twice weekly or oftener, whilst at sea. Hygienic measures were considered equally important. He directed that men, clothes, hammocks and quarters were to be kept dry. " Airing of the Ship " as often as twice a week took place, by employing fires of smoking gunpowder with vinegar.

The remarkable feature of this second voyage is that apart from Cook's navigational skill and geographic contributions, he demonstrated that long voyages could be undertaken without a high mortality from sea diseases. On his return he addressed a paper on his voyage before the Royal Society and was awarded the Copley Medal.

The sad story of the third voyage, which Cook never completed himself, shows evidence that the rules and regulations of conduct which he laid down were adhered to by his succeeding Commanders. As a result, the *Resolution* lost five men by sickness, three of whom were in bad health when they left England, and the *Discovery* did not lose a man. Captain Charles Clerke, who took over command on the death of Captain Cook at Kakooa, died himself on the 22nd August, 1779, from consumption, signs of which were present before he left England. This voyage lasted four years, two months and twenty-two days, from 1776–1780.

Thus, although he himself was buried many thousands of miles away, the principles established by this great navigator survived and were practised by his disciples. It was a living and lasting honour to his name that the two ships returned to England with such a splendid record of good health. It is fitting to append these principles described by Roddis (1914), who states that Cook emphasized not only the use of fresh provisions including meat, fowl and fruits and vegetables, but such antiscorbutics as sauerkraut and fresh wort of malt to be given as prophylactic measure against scurvy. Good drinking water, cleanliness of ships and crew alike, and the keeping of the ship, clothing and bedding dry were definite " musts." Cook was well in advance of his time when he attempted to remedy the hazards of exposure and fatigue, and in his appreciation of the benefits of rest, warmth, sleep and contentment of mind.

In this section I propose to give an appreciation of the early naval writers and thinkers who concerned themselves with the health and welfare of the sailor and his environment. For this material I have drawn largely from the work of Hodges and Hughes (1936).

Lord Charles Howard in a letter to Lord Burghley on the 10th August, 1588, wrote of the lack of care for the sick that prevailed in those early days, and which was appreciated by some sea captains whose humanitarian feelings decried the sad state of affairs which existed. Howard pointed out how sickness and death were prevalent to such an extent that men, when ill and having no place to be received for care and treatment, were left to die in the streets at Margate, so that he in compassion went ashore to see for himself if some lodging might be found for them. The best he could do was to get some barns and outhouses, and so small was the relief provided that he adds "It would grieve any man's heart to see them that have served so valiantly to die so miserably."

On board the *Elizabeth Jonas*, Howard describes a " great infection in her," and of the five hundred complement, in one month at Plymouth, there were two hundred dead, so that he was " driven to set all the rest of her men ashore to take out her ballast and to make fire in her of wet broom, three or four days together ; and so hoped thereby to have cleansed her of her infection ; and thereupon got new men, very tall and able as ever I saw, and put them in her. Now the infection is broken out in greater extremity than ever it did before and men die and sicken faster than ever they did." Howard believed the infection remained in the pitch and described what amounted to a full-blown epidemic throughout most of the Fleet, and his conjectures on the cause were most sound, as he blamed the unhygienic conditions prevailing, and adds " they have been so long at sea and have so little shift of apparel, and so few places to provide them of such wants, and no money wherewith to buy it, for some have been—yea the most part—these eight months at sea." He reflected on the good a thousand pounds worth of hose, doublets, shirts, shoes and such like, would accomplish, and unless this were done he would most certainly witness most of the mariners go naked. He concluded his letter with a request that " Mariners " be " pressed " and sent on to him quickly, along with money so that he could discharge the sick and so relieve them.

Another sea captain took up the task in 1629. Sir Henry Mervin, in a letter to the Lords Commissioners of the Admiralty on the 25th December, 1629, wrote " I beseech your Lordships for the honour of the State, suffer not the service to become a scandal, but be pleased to take speedy course for the redress hereof ; for foul winter weather, naked backs and empty bellies make the common men voice the King's service (James I) worse than a galley slavery ; and necessitous wants together with famine pleading the cause of their disorders, lays open a way to what they are too prone already to—mutinous disobedience and contempt of all commands, for necessity hath no law."

This outspoken sailor wrote that same period to the Earl of Dorset, of the neglect and poor provisions of six ships stationed in the Downs, and tried to enlist the Earl's support in his effort to effect proper victualling for ships. Such were the conditions, and such was his candour that he concludes " Let not your eye that looks on the public good overlook this mischief for without better order his Majesty will lose the honour of his seas, the love and loyalty of his sailors and his Royal Navy will droop. I beseech your Lordship pardon plainness that proceeds from an honest heart, for the disease admits no palliated physic."

Shortly afterwards, a diatribe on the calumnies of the victuallers of His Majesty's Navy appeared in an essay by Nathaniel Knott [30]. His *On Advice of a Seaman*, in 1634, was dedicated oddly enough to the Archbishop of Canterbury. He levelled a piercing shaft at the adulterators of provisions and beer dispatched to ships, which food and drink within the first month became unfit for consumption. However, as no replacement at sea could be made, the poor sailor had to bear it as best he could and make do. This was too much for Knott, and he writes his passages charged with fire and indignation. He states : " Little do these monster-bellied brewers think (or if they do they make less conscience) of the watching, labour and miseries of a poor sailor, in double danger both of the fight and of ship-wreck, by day parched with the heat of the sun, by night nipt and whipt with blustering tempests ; and when he is wet, cold and hungry, should not the poor soul have a can of beer to refresh him, but he must say ' Mors est in olla,' when he drinks it, or a cake of bread, but he must think he is set to a penance when he eats it ? The price of good and bad is all one, if care were in the receiver and the deliverer no deceiver.

" They that know how hot the Southern Countries are in the summer time, and the bare allowance of a sailor, would not wish him a draught of stinking puddle to quench his thirst, or if they should, they were dog-hearted men. Let me but ask you why our men are more subject to the smallpox, to calentures (fevers) and to that terror of sailors, the scurvy, than other nations ?

" Look unto the Hollander, who drink water, and thou shalt find them healthy and as fat as Hebe. On the other side, but cast an eye into our English ships, who drink beer, and they look as mortally as a death's head with a bone in's mouth, they swallow the cause in their drink."

Thus, poor and inadequate feeding in relation to disease was appreciated. In Boteler's *Sea Dialogues*, 1634 [31], the " new " and " old " idea about feeding are expressed in conversational style, thus : " Captain, —— ' without doubt, over much and indeed excessive feeding upon these salt meats at sea cannot but procure much unhealthiness and great infection, and is certainly one main cause that our English are nowadays so subject to calentures, scorbutes, and the like contagious sickness, above all other nations ; so that it were wished that we did more conform ourselves to the Spanish and Italian nations, who live most upon rice, oatmeal, biscuits, olives, oil and the like ; or at least our neighbours the Dutch, who content themselves with a far less proportion of flesh and fish than we do, and instead thereof, do make up their meals with pease, beans, wheat, flour, butter, cheese and those white meats, as they are called.'

"Admiral.—'It were well indeed if we could bring ourselves to this provident and wholesome kind of sea feedings but the difficulty lieth in that the common seamen with us are so besotted in their beef and pork, that they had rather adventure on all the calentures and scurvies in the world, than to be weaned from their customary diet, or but so much as to lose the least bit of it.' "

The date of the dialogues is given as 1634, but the Admiral's words are apt and appropriate to the situation 250 years ago, seven years ago, or yesterday, and demonstrates the peculiar feeding habits of the British sailor. However, the sailor overseas to-day and in a few questionably run restaurants of their choice in home ports may indulge in his monotonous inclination towards steak, eggs and chips. This diet, his colleagues of two centuries ago, would not logically defend by virtue of being a tasteful dish alone. It was a necessity, since disease with its decimating prevalence of that other day had to be reckoned with. Now that basic health hygiene and sanitation are installed, the luxury of a fastidious feeding habit is a less urgent national concern.

Allison (1943) quotes Fletcher (1786) who gives a table in his book describing a typical weekly victualling chart of the time of Lind, on board ship :

	1 lb. of	½ pt. of	2 lb. of	1 pt. of	2 oz. of	4 oz. of
Sunday	Pork	Pease	—	—	—	—
Monday	—	—	—	Oatmeal	Butter	Cheese
Tuesday	—	—	Beef	—	—	—
Wednesday	—	Pease	—	Oatmeal	Butter	Cheese
Thursday	Pork	Pease	—	—	—	—
Friday	—	Pease	—	Oatmeal	Butter	Cheese
Saturday	—	—	Beef	—	—	—

Daily : 1 lb. of biscuits, a gallon of small beer. A pint of wine or ½ pint of spirits diluted in warm climates. Wheat might be substituted for oatmeal. Flour, suet and plums (prunes) might be issued instead of Beef.

Quantity was considered sufficient at that time, but quality as we have seen was often so poor that the quantity was in consequence often reduced. It was not the contractors' fault all the time, as storage in the main holds and lack of means to preserve food caused considerable waste. The system of contracting food-stuffs was done away with at the end of the eighteenth century when the civilian Victualling Board was established as a special department of Admiralty administration. The old method of victualling was similar to that practised to-day in small vessels and known as "canteen messing." Here the ship's company was divided into messes of four to eight men doing the same type of duties and living in one section as a team. Every day, one of the mess collected the whole mess's rations and they prepared it as the senior hand of the mess considered best. The cooks then put the finishing touches to it.

The efforts of the early protagonists for reform began to bear the first crop of fruit from the dynamic seeds they planted when the Admiralty Committee directed a Naval Commission to be set up to search into the requirements of the sick and wounded in 1652–1653.

The proposals of the Navy Commissioners (undated, but in the time of Charles I) [30] were adopted and they recommended : " That three persons of approved ability and godliness (whereof one to be a Surgeon) be appointed to attend this service with a competent salary. That the Commissioners thus constituted give seasonable and timely direction to mayors and chief officers of all sea-port towns to make provisions for all sick and wounded men as they shall be set on shore from any of the ships in the State's Service, and to employ what surgeons or other means are in those several places attainable for their relief and care ; and upon notice of a deficiency in any place of such helps as are necessary in that kind, they are to provide either by removing them or by sending surgeons and medicaments to them, that the recovery and cure of the distressed may not be retarded or prejudiced."

The Commissioners, too, considered the awarding of gratuities to those wounded in the Service, with yearly pensions. The gratuity not being at first greater than £10, or the pension £6 13s. 4d. a year, were subject to increase on appeal. Likewise, widows, children and dependants were to receive a gratuity in the case of a sailor " slain in the service " and to give such gratuities to them not exceeding *£10*, " as in their judgments be most agreeable to rules of charity, and may demonstrate the State's sense of their suffering conditions, and in extraordinary cases to report as before." Thus we see the ideology of the " Speenhamland " system flourishing one hundred and forty years before that hand of cold charity settled in Berkshire.

The gratuity and pension payments may not arouse much enthusiasm as a measure of period social security, but it was a start in the right direction. Consider the salary of a surgeon in all the six rates which was the same, namely, *£2 10s. 0d.* a month in 1653.

Hospital ships, a seventeenth century innovation, were used during the eighteenth century and were usually hired merchantmen or old sixth rates with the guns removed and gun decks cleared so that accommodation and treatment could be given to the surplus sick men from the ships.

From *Boteler's Dialogues* [31] I quote the following conversation :

" Admiral, —— ' Captain, have you not in all great fleets, certain ships appointed for the receipt of your sick people, which you call Hospital Ships ? '

" Captain, —— ' Yes, and there is nothing more necessary than that every squadron of such fleets should be very sufficiently furnished with them, and that these ships be appointed and known before the fleet puts out to sea, and that they be fitted with convenient cabins, for the receipt of sick people, and every ship provided with an able chirurgeon with his mate, to be continually resident aboard, who is to have his chest every way well furnished ; that so as any person, either common man or common officer shall happen to fall sick, and specially of a sickness known or suspected to be infectious and contagious in any ship of the squadron, he may be speedily and with the first opportunity removed and received into that hospital ship which is appointed for it ; whereby the sick may not only be separated from the sound, but likewise be better lodged and looked unto by the chirurgeon.' "

The staff of the larger Hospital Ships consisted of one physician, one surgeon, four surgeon's mates, six male assistants, one barber and four washerwomen.

Sailors on recovery and made fit for duty were returned to their own ships. This was done by the Hospital Ship hoisting the sailor's ship's pennant, and a boat was sent to embark him.

The victualling was done by the purser who contracted with the Commissioners of the Victualling Board. After the year 1761, the Commissioners for the Board for Sick and Wounded took over the Victualling Board's duties. Sick extra supplies of flour, rice, barley sugar and currants were extended by the efforts of Trotter who caused to be added, livestock, vegetables, fruits, eggs, porter and milk, purchased when the ship reached a port.

When Royal Hospitals for the Navy became available in 1754, the Hospital Ships were relegated more of the accommodation duties in harbour and less of the treatment aspect. The organization existing ashore before that date for the treatment of the landed sick and wounded was a sick quarters privately owned and operated usually by ex-Navy Surgeons and General Practitioners. The other refuge was in Civil Hospitals listed in the order in Council of Charles I, in 1664, which stated that the buildings were to be made available for the reception of the sick and those who became wounded during the time of war at sea whilst in the service of the Navy.

Funds for the care of sick and wounded came from the resources of the " Chatham Chest." This fund originated from the suggestions of Drake and Hawkins in the sixteenth century when each parish in the County contributed a small weekly sum for the maintenance of invalid sailors born or resident within its boundaries. Later it became a contributory scheme whereby sailors donated sixpence a month, and this adoptive method became compulsory in 1604, and continued until the early nineteenth century. During the eighteenth century the funds were administered as a trust under the guardianship of the Commissioners for the Board of Sick and Wounded. The yearly surplus was kept in a strong chest at Chatham Parish Church. This, no doubt, was the origin of the Medical Mutual Aid and Insurance schemes which flourish at the present time.

Difficult as the conditions were to succour the sick and wounded, dissolute as many surgeons and mates were said to be, they yet practised their art and skill with a humanity of which the sailors were the first to be appreciative. Their resultant statistics, as Allison (1943) states, showed even less of a mortality rate than the more candid London Physicians owned to, that of one in five which they considered favourable. It is not clear which particular rate is indicated by this figure of one in five—the annual death-rate as a whole or the case fatality rate of sailors on the sick list.

The earliest record of a hospital near Gosport, Hants, is in 1713, when a privately owned hospital called the Fortune Hospital of 700 beds was used for the treatment of seamen of the Royal Navy. The proprietor had a contract with the Commissioners of the Board for the Sick and Hurt, for the treatment of patients at a scale rate, " so much per head which was the custom of the time " [32].

The need for hospitals for the care of the sick and wounded was growing, and, in 1741, the Board of Admiralty addressed a memorial to His Majesty in Council, to begin a building programme. However, no active steps were taken until 1744 when the Earl of Sandwich, the First Lord of the Admiralty, supported a second memorial which proposed the establishment of three Royal Hospitals at the ports, Chatham, Portsmouth and Plymouth. In case this was thought to be too ambitious, it was stressed that at least one hospital should be built at Portsmouth. Plans were enclosed and it was designed for 1,500 patients and at an estimated cost on completion amounting to £38,000

The good work started in 1745, a year later, and the hospital's name was given as the Royal Hospital at Haslar. The site chosen was the sandy promontory south-east of Gosport, overlooking Portsmouth Harbour entrance and Spithead. Wards were opened for the reception of patients in 1754, even though the structure was not completed until 1762. Actual cost of building was several times the original estimate given.

Work on the Royal Hospitals at Chatham and Plymouth was also begun at that time, and although construction at Plymouth Hospital at Stonehouse, started in 1758, it was completed the same year as Haslar, in 1762.

The design of Haslar Hospital was after that of Greenwich Palace, the architect being John Turner. Building materials used were red bricks faced with white stone. At the main entrance there was a sculpture executed in Portland stone representing the " Royal Arms of George II " in the centre ; on the left, the figure of Navigation leaning on a rudder and pouring oil on the wounds of a sailor ; on the right Commerce and a sailor in distress with a bird carrying in its beak the serpent of Æsculapius [24].

The completed hospital, as stated before, had a frontage length of *567* feet, with two wings each extending back for a distance of *553* feet, thus forming three sides of a quadrangle. The wings were arranged on the modified block system and comprised a double row of buildings, one inside the other, with arched covered ways opening on to the central " airing ground." The fourth side which faced south-west was not built upon and had the hospital chapel in the centre, beyond which was the hospital burial ground.

Wards were arranged in four sections ; two medical, given odd numbers at first, and two surgical given even numbers, these were later named after famous naval persons.

After 1762, there was ward space for 1,800 inmates, allowing 600 cubic feet of air per person.

As we have seen from Lind's letter of September, 1758, the Physician in charge was the Superintendent who controlled the administration of the hospital in conjunction with a " Council," composed of the more senior officers. They were responsible to the Commissioners of the Board for Sick and Wounded. It was that body who paid the salaries and made new appointments including that of Matron, Chaplain, Steward as well as Surgeons, Assistant Surgeons and Apothecaries, as were required.

This arrangement continued in force until 1795 when lack of discipline and abuses were brought to light. It was found that desertions from hospitals began to mount, store accounts were improperly kept and more attention was being paid to the private practice of the medical officer than to his official duties, and this finally culminated in the appointment of Lay Governors or Captain-Superintendents-in-charge.

These senior executive officers brought the methods of the quarter deck into the hospital, and there was great dissatisfaction on the part of the medical staff to this new ruling hierarchy which lasted for the next seventy-five years.

The first Surgeon-General of the Fleet was appointed in 1664 and Robinson (1894) makes a caustic comment on this appointment in stating that since no beneficial results were apparent, it might be considered that his post was a bit of jobbery characteristic of that dissolute and venal age.

In June, 1703, an order was issued that all medicines, drugs and instruments, &c., supplied to ships were to be reviewed at Apothecaries' Hall in London before disposal to ships. Surgeons were to pack and seal chests and bring them up to the Hall for examination. In that same order, surgeons were first instructed to keep journals and records of cases.

The naval surgeons resented the part of the order requiring them to submit their stores for survey by the " fumbling old miserly curmudgeons " [33] of the Hall whom they suspected of trying to secure a monopoly on the supply of medicaments, and also of being subject to the injustice of being forced to buy the drugs at a higher price and of inferior quality than materials which could be purchased elsewhere. In addition, there was the laborious journey and expense incurred by carting the heavy medical chests to the Hall and then to pay the high inspection fees. Bribery, too, featured in this pantomime, because of the necessity to avoid delays over frivolous pretexts in the securing of the necessary certificate of approval.

However, this state of affairs continued for over a century and Smollett wrote of this practice with scathing criticism in 1740 [37]. Smollett, that same year, described the method whereby a Surgeon Mate's warrant was obtained. It appears that the first step to be taken by the candidate was to obtain from the Board of Commissioners at the Navy Office permission to sit an examination in Medicine and Surgery at Surgeon's Hall. Incidentally, the fee of half a crown to the Clerk to the Secretary of the Board was a necessary item. This letter of permission to proceed to the examination which took two days to obtain, had to be left with the Clerk at Surgeon's Hall (with a shilling to hasten its path to the examiners). The examination then being held and if the examiners were satisfied with the candidate's fitness, he was awarded a pass certificate for a fee of five shillings. Sundry other charges were made, such as three shillings and sixpence to the beadle of the Hall, a shilling to the old women who swept the Hall. In all, thirteen shillings in incidental " Fees " were doled out and this, really, was only the start.

To obtain a Warrant, influence and a certain amount of bribery had to be resorted to. In some instances in order to obtain a post as Surgeon's 2nd Mate on board a 70-gun ship the charge might easily amount to £3 12s. 0d., and mention is made that some of the fee was believed to have found its way to very high ranking officials. There was a set fee of thirteen shillings for the Warrant. Thus *£4 18s. 0d.* was the charge in full to obtain an appointment the salary of which amounted to the princely sum of *£2 10s. 0d.* a month if he was paid in full since Surgeon's Hall removed a portion for their labours.

Many prospective Surgeon's Mates, however, were " pressed " youngsters carried on board where they were made " Loblolly Boys," and if they showed merit, the surgeon's influence might in time be sufficient to bring about their being granted a warrant.

In a ship of the line, the status of a Surgeon's Mate was that of an " Inferior Officer." He lived in a mess, the cockpit, which was a six-foot-square space, screened off with canvas and shut in by chests so that the whole presented a dark and foul-smelling niche. The food was ordinary ship's rations supplemented with onions or some delicacy purchased during infrequent visits ashore at ports.

In smaller ships, he might mess with the Master's Mate and Gunner.

The quarter-deck was strictly out of bounds to him, and general ship's movements and business came to him only by way of lower deck rumours.

As for Masters, Surgeons and Pursers, they did not officially receive the title of Warrant Officers of Wardroom Rank until 1808. Before that date Surgeons, Chaplains and Pursers were often invited to dine at the Captain's table and enjoy his hospitality. About the end of the eighteenth century they became members of the officers' mess by invitation.

The Wardroom as we know it to-day was formed about the middle of the nineteenth century.

An organised Naval Medical Service was in existence since 1512, when medical officers were called " Sirurgions " and had different ranks and rates of pay. During the seventeenth century the designation of chirurgion or chyriurgion was used. In the eighteenth century, the title of " Surgeon " was in common usage and has continued as such up to the present day with the addition of qualifying ranks.

In 1697, the Navy Board, founded by Henry VIII, was the authority for appointing Surgeons, through the agency of the Commissioners for the Board for Sick and Wounded, and issued Warrants to this effect when the examination at Surgeons' Hall was passed. The responsibility was vested in the Company of Barber Surgeons for the conduct of the examination. Calumny was being heaped on the head of the United Company of Barber Surgeons because of their charges to Surgeon Mate's candidates, and in 1739 the company addressed a public petition to Sir J. Salter, Lord Mayor of London, presenting their case.

" Your petitioners do without any Reward or Benefit to themselves, employ a great portion of their time in the Service of His Majesty, as their Predecessors have done for some hundred years past in the services of his Majesty's Royal Predecessors Kings and Queens of this realm, by Examining at their Public

Hall all the Surgeons and mates who serve on Board the Royal Navy ; and by viewing all their chests of medicines, Instruments and Journals, as also by viewing all such officers as are maimed in the Fight at Sea and for Superannuation."

This, however, was not followed in practice, and a House of Commons Committee examination of the Corporate coffer entries showed an average of £73 0s. 0d. yearly, " from sea Surgeons alone," for the period 1739–1744 [34].

Young (1890) lists the Masters and Wardens of the Company of Barber Surgeons for the year 1739, as follows :

William Petty ...	Master
John Truelove	Wardens
James Dansie	
Thos. Essington	

These men were probably the examiners of Lind at Surgeons' Hall. This body continued to play a role in this respect until 1745 when the company was divided into the two separate units.

There was an additional requirement for young surgeons' mates in 1709 to pass an examination in medicine, conducted at first by a physician of the Board for Sick and Wounded, but in 1715 when peace returned the examination was conducted by the Physician of Greenwich Hospital, who did also inspect the Medical Journals when Surgeons returned from voyages.

This matter of keeping accurate journals was appreciated, and the Company of Barber Surgeons in 1731 passed a resolution that Journals should be inspected, marked and copied for permanent record.

The United Company of Barber Surgeons underwent a schism in 1745 and became two separate companies. The new Surgeons' Company was entrusted with the duty of examining candidates for the Army and Navy Medical Services.

From the Transactions of the Navy Board.[1] it is noted that on the 10th February, 1759, a ruling was made that : " Surgeons were to lay their Journals of Practice for the future before the Commissioners of the Board for Sick and Wounded to be inspected by the physical members of that Board instead of the Physicians of Greenwich Hospital, and not pay any Surgeon till he produces a certificate that his Journals have undergone such inspection."

The College of Physicians, though founded in 1518, did not have a very close liaison with the Naval Medical Service, or with Fleet Physicians who were regarded as men of higher status and greater learning than Surgeons. The Navy Board did, however, approach them when nominations for appointments as Physicians to the Fleet were required. These posts were of higher status and better paid than the Surgeons and whereas Surgeons' mates could be impressed to the Navy, Physicians were not. A physician's pay was called an allowance of twenty shillings a day at sea and those appointed at the several ports had a salary of £200 a year. Their duties were those of consultants, supervising the general work of the Surgeons in various ships, examining stores and inspecting sick returns. It would correspond to the duties of the Surgeon Captains and Surgeon Rear-Admirals of to-day. It was possible that they might receive the promotion from Surgeon's status as in Trotter's case or direct appointment as Physician after an examination by the Royal College of Physicians of London and Edinburgh, as in Blane's case.

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[1] Public Records Office, London.

The formal teaching of medicine in Edinburgh began in 1681 with the formation of the Royal College of Physicians of Edinburgh by a Royal Charter. At the time, the Town Council, the Bishops and the Universities objected to its formation. In 1683, rules and regulations were formed by the College for the granting of a licentiate's diploma under supervision of the Fellows [35].

At a much later date, in 1720, the Medical Faculty at Edinburgh University was initiated and requirements for the M.D. degree were then laid down. For this degree a candidate was required to pursue a course of Study of Medicine for at least three years at Edinburgh, or some other University. The curricula was to contain lectures on Anatomy, Surgery, Chemistry, Botany, Materia Medica and Pharmacy, the theory and practice of medicine. Clinical Lectures were introduced in the hospital. At the end of this period, the student was required to compose a dissertation in Latin on some medical subject, and submit it first to one of the professors and then to the Faculty, when the candidate was questioned on his thesis. The next stage, the student was examined by two professors on medical subjects. In many cases, this completed the test, but if it was not considered sufficient by the Faculty, the student was given an aphorism of Hippocrates by one professor for discussion and another gave him some medical question. Of the first, he was requested to illustrate the subject by a commentary, and answer the second with sound arguments before the Medical Faculty. Following that he was given two Histories of Diseases accompanied with questions in writing, and he was to give his opinion on them before the Faculty. If the student was successful now, his thesis had to be printed and publicly defended if necessary. All proceedings were conducted in Latin.

As Lind received his degree in 1748, the same year he left the Navy, then much of the above official procedure must have been waived.

Another body of men, the Apothecaries (*see* p. 32) came into the picture in 1617 when they received a charter giving them licence to sell and dispense drugs. They also treated patients in the seventeenth and eighteenth centuries. This company of Apothecaries in 1703 obtained the sole contract to supply drugs and all requisites of medical stores to Surgeons on appointment to a ship. For this privilege they often charged exorbitant prices to the poor surgeons, who had to purchase these stores out of their salary.

There was a £40 yearly grant given to the Surgeon in 1783, called the Queen Anne's Bounty, to meet these charges for supplies, but £40 was not sufficient to meet the full charges, and many complaints over this exploitation were raised. Fortunately, but too late, the practice of the monopoly ceased 100 years later, when the Admiralty took over the provisions of stores at public expense. Lind made a special emphasis on this point in his letter to the President of the College of Physicians of Edinburgh, September 1758.

At the time of Lind's service the Surgeon's duties were laid down in an Admiralty order of 1731. These included :

(1) Visiting the sick on board twice a day or more often as required.

(2) Informing the Captain of the Daily State of the sick.

(3) The keeping of a day book of his practice.

(4) The rendering of two Journals per year, one for disease, the other for recording all surgical operations performed.

(5) Information sent with a patient when discharged ashore to a hospital or Sick Quarters, in the form of a written account of the case.

(6) During action, his station was to be in the hold of the ship where a platform was to be arranged for the reception of the sick and wounded.

Allison (1943) quotes James Yonge, a Surgeon's mate of the late seventeenth century, aboard a ship in action at Algiers, and who laments, " Here began my slavery, for boiling gruel, barley water, fomentations, washing towels, and making lint, spreading plasters and fitting the dresses was all wholly on my hands, besides emptying buckets they went to stool in, a nasty and mean employment, but such as usually *Chyriurgion's* mates formerly did in the Navy."

Not only were the duties of the Surgeon's mates onerous, but his status in the ship was very inferior. His daily duties commenced with the mustering of the sick, who foregathered on the main deck in view of the Captain and Surgeon. The sick that could walk were summoned by a boy who walked round the mess decks ringing a small hand bell, calling out the sick to parade. What dressings were necessary were done there by the Surgeon's mates.

Smollett, as was stated earlier, who was a Surgeon's mate at the same period as Lind, speaks to the world through the lips of *Roderick Random*, who had a lot to say of the appalling conditions and practices under these conditions where below decks the stricken sailors would be slung in hammocks only 14 in. apart, deprived of ventilation, light and sanitary conveniences. It may be that he exaggerated somewhat, but was it really difficult to stretch the imagination as to the way of life at sea during that period ? He was a chronicler much as was Dickens a hundred years later. If these men revolted the polite by exposing the baseness of certain environment, so much the better if an earlier rectification resulted by arousing the investigating spirit.

At a later date, Captain Edward Thompson writing, *A Sailor's Letter*, in 1767, on the state of naval hygiene at the English Harbour at Antigua the year before, is quoted by Tunstall (1936). The Captain is recovering slowly from an attack " with the white flux." In his small room are twenty-six other persons, and he is officiating as Chaplain and had buried eight men that morning. He goes on to say : " Fluxes and fevers are the reigning distempers, and both I attribute to the water drunk by the seamen, which is taken out of tanks or cisterns, built by Admiral Knowles. It is all rain water, and covered close up, which for want of air breeds poisonous animalculæ, and becomes foul and putrid. The melancholy effect it produces might be in a great manner prevented by boiling the water before it is issued or ordering the people to do it. This would destroy the vermin and correct the putrefaction." Later this thoughtful gentleman states that after long observation he believed that : " most distemper in southern climates arise from water drunk, as ship sicknesses do from bilge water ; which is evidently proved in leaky ships being always more healthful." His final recommendation is that all officers, Naval and Merchantile, should pump salt water in every day to the bilge, and to boil their fresh drinking water, " for the good of themselves and cargoes."

Captain Thompson undoubtedly was a keen critic of his own times which we see again in his observation on mutinous outbursts, of which he writes, " it was the misuse of discipline and appalling unhealthiness of naval life which drove men to desperate actions " [36].

Ship constructional technique was changing and in keeping with this a great advance was made when the improved Sick Berth was designed by Captain Markham of the *Centaur*. This modification took in the area of the two foremost guns under the forecastle and included the roundhouse and the midships or cattle-pen. Overhead was a large sky-light which could be opened for ventilation and light on fine days. In larger vessels the Markham Sick Berth was designed to allow room for twenty-two patients and more room on the other side of the ship for convalescents if necessary. This innovation was begun in the early nineteenth century.

In conclusion I quote from Taylor (1920), a critical American naval writer, who expressed himself so distinctly and aptly in his appreciation of the tortuous path trodden by those three gallant men, Lind, Blane and Trotter, in their successive efforts to reach and open the portals of hygienic reform, when he stated, " They struggled against stupidity, ignorance, prejudice and indifference in high places and low, the Admiralty and Forecastle ; they had the hard task of seeking to break down immemorial custom ; dared to challenge ' tradition ' ; hammered at the walls of a hierarchy as soul chilling, as rigorous, as iron bound as any Brahmin caste ; preached seemingly frivolous novelties to insular conservatism that held hardships essential for hardihood."

And yet the story of those Sea Captains I have touched on minutely and those cavaliers of the deep of the eighteenth century, who did so much to preserve Britain and who made this small Island the unconquered soil and harbourage of a great navy, moved in the pattern that was fitting to their time. We are wise to-day after the act, and our fallacy is an excessive patronizing benevolence towards our past masters, as will our progeny be toward us, even if we deserve it but meagrely.

These men lived, navigated, explored, devised strategy, fought and campaigned and experienced many hardships of their profession as did Lind in his particular calling, but in his case it was without the honours of national glory which were bestowed on them. Strangely enough he did not seek honours, rather he demonstrated his strength in his writings and in influencing his colleagues by example and persistence in the laborious task of establishing the concept of preventive medicine and practice of hygienic measures in the Navy afloat and ashore. He personally did not witness the full and ripe fruit of his labours achieve full bouquet but there must have been some deep satisfaction in his following the course and progress of Cook's last two voyages, where the conditions aimed at and the achievements were directly related to his dogma. Then, too, he knew that his successors, Blane and Trotter, would continue to nourish the germinating hygienic concept, and would prune and shape the sapling, adding their warmth of personal experience and influence to strengthen the roots of this delicate structure.

Many have since added their labours to fortify, guard and supply the needs of this noble tree which has disseminated its seed to many lands and climes, and where the species will flourish or decline, dependent on its keepers.

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